1100 WATER MAIN WORK

The following provisions shall apply to the construction of all water mains and appurtenances, chambers, service branches and contingent work.

ITEM 1100 - GENERAL PROVISIONS

1100.01 General

1100.02 Material

1100.03 Plans and Standard Drawing

1100.04 Construction

1100.01 General. Before beginning any work under the Contract, plans will be furnished to the Contractor showing approximate location of existing water mains, chambers, service branches, and other existing C.W.W. installations pertinent to the Contract. An examination of the site shall be made by the Contractor and the C.W.W. Inspector, and the condition of all C.W.W. appurtenances noted.

The Contractor will be held responsible for the proper care and maintenance of all C.W.W. appurtenances which are found to be in good condition, and for those repaired or replaced during construction.

The condition of existing paving, not to be removed or replaced by a street improvement contract, shall likewise be noted. When the work takes place in political subdivisions other than the City of Cincinnati, a representative of that political subdivision should be present. Upon completion of the project, the area in the vicinity of the project, shall be in as good or better condition than existed prior to the beginning of work.

After the Contract has been awarded, and prior to starting the work, the Contractor shall contact the director of C.W.W. who will schedule a meeting with representatives of the political subdivisions involved and the Contractor. The purpose of this preconstruction meeting is to discuss construction site safety, construction schedules, traffic control, and other aspects of the work that may concern the interested parties present.

The Contractor is responsible for obtaining all licenses and permits necessary to complete the work, except for street opening permits in State of Ohio highways outside of other political subdivisions. The C.W.W. or the responsible contracting agency will obtain these permits.

The Contractor shall maintain traffic in a method approved by the authority having jurisdiction, or as specified in the Special Provisions. Proper and adequate access across all roadways and driveways serving business concerns in the construction area shall likewise be maintained. Temporary sidewalk, wooden ramps, or bridges shall be installed to allow the movement of pedestrian traffic at all times, with special consideration being taken regarding the safety of school children.

All water main work, labor, and material shall be in strict accordance with the standard drawings, specifications, and supplements thereto, in force at the time of the opening of the proposals. Copies of these items may be purchased from the Cincinnati Water Works, 4747 Spring Grove Avenue.

When welded joints are required, the contractor will retain the services of a testing agency, designated/approved by the C.W.W., to perform testing of all welds. Costs for this service shall be included in the price bid per lineal foot [meter] of laying pipe.

1100.02 Material. Unless specified in the item itself, valves, brass couplings and fittings, required for the completion of a ductile iron pipe contract, will be furnished by the C.W.W.

On a concrete water main contract, unless specified in the item itself, all pipe and fittings, valves, bolts, nuts gaskets, washers and brass couplings and fittings, required for the completion of a contract will be furnished by the C.W.W. The concrete pipe material will be delivered, via piggyback trailer, to the construction site, direct from the supplier. The contractor is responsible to coordinate all details relating to concrete pipe materials delivery, off-loading and storage.

The contractor shall haul all items, other than concrete pipe items, furnished by the C.W.W. from a C.W.W. Distribution storage yard to the work site. The contractor will be paid for this hauling, except copper service branch material, under Item 1102.

The Contractor is strictly responsible for all materials issued to him and he must return all excess material to the C.W.W. for credit. Any material which is lost, stolen, damaged, or broken after the Contractor has received them, will be deducted from his final payment at the current price paid by the city plus 33 per cent for handling and storage.

All other material must be furnished by the Contractor and shall conform to the specifications as indicated in each item and shall be subject to both shop and field inspection by the C.W.W. All charges for shop and field inspection shall be paid by the Contractor where applicable.

Where indicated on the Plans that pipe and fittings, valves, polyethylene, valve boxes, chamber casting, couplings, copper service pipe and fittings, bolts, nuts, gaskets, and washers required for the completion of the Contract shall be furnished by the Contractor, such material shall conform to the applicable City of Cincinnati Department of Purchasing Specification and/or C.W.W. Standard Drawings.

All valves 4" in diameter and larger must be purchased from the C.W.W., unless specified as furnished by C.W.W. in bid documents.

1100.03 Plans and Standard Drawings.

The underground utilities which are part of the contract drawing have been shown in accordance with Section 153.64 of the Ohio Revised Code. In accordance with this Section, the contractor is advised to notify the affected utilities two working days prior to commencing construction operations.

The Contractor is advised that all utility information has been shown on the contract plans from information provided by the owner of each utility in compliance with Sec. 153.64 of the Ohio Revised Code. In cases where utility information is incorrect and it results in a change in the contract plans the Contractor shall first notify the owner of the utility to determine the necessary course of action. The Contractor shall submit any subsequent claims as a result of downtime or additional work to the owner of the conflicting utility. The Cincinnati Water Works will not accept claims for any utility other than those as a result of incorrect water main and related appurtenance information.

downtime or additional work to the owner of the conflicting utility. The Cincinnati Water Works will not accept claims for any utility other than those as a result of incorrect water main and related appurtenance information.

The proposed location of mains, valves, connections, fire hydrants, and water services, as shown on Contract drawings, is diagrammatical only. The final location is subject to field conditions and will be determined by the C.W.W. Inspector as work proceeds.

Standard drawings concerning construction and installation details for water main work are on file in the Engineering Record Sections of the Water Works, 4747 Spring Grove Avenue, or the City Purchasing Department, and are available for reference or purchase.

1100.04 Construction. The amount and extent of new water main work will be shown on the Plans. Reconstruction and replacement of existing lines and appurtenances may be required as work progresses, and will be determined during construction.

The Contractor's work hours shall be subject to the approval of the Director. The Director shall have the authority to direct the application of the Contractor's forces to any portion of the work which, in his judgement, may so require. The Director shall also have the authority to order the Contractor to increase or decrease the work forces at such locations that he may indicate.

All water main work shall be done in strict accordance with the specifications of the C.W.W. and under their direction, supervision, and inspection.

The Contractor shall adjust all chamber castings, valve boxes, fire hydrants, and water service boxes as indicated on the Plans. Those items to be salvaged or relocated will be so indicated on the Plans.

All valves in the Cincinnati Water Works system will be operated by qualified C.W.W. personnel only.

The C.W.W. cannot, however, guarantee that all operated valves will provide a water-tight shut-down. Every effort will be made to make a shut-down as quickly and effectively as possible. No allowance will be made to the Contractor for any delay in closing a valve.

The Contractor is responsible for giving sufficient notice when a shut-down of valves will be required for his work.

It is expressly understood and agreed that all costs and charges for the restoration of street paving, sidewalks, or other areas opened or disturbed in the pursuance of water main work in accordance with the Plans, have been included in the unit prices bid on the various items in the Proposal.

ITEM 1101 - LAYING PIPE AND FITTINGS

1101.01 Description

1101.02 Responsibility for Material

1101.021 Material Furnished by Contractor

1101.022 Material Furnished by C.W.W.

1101.01 Description. The Contractor shall furnish all necessary labor, material, tools, and equipment required in the laying of various sizes of water mains and fittings. This work comprises unloading of material, except concrete pipe and fittings, proper storage of all pipe and fittings, excavating the trench, laying and joining the pipe, installing polyethylene wrap, cutting and removing existing pipe, making necessary connections and backfilling the trench, the repairing or replacing of all drains, sewers, utilities, and any other structures that may be disturbed or damaged by the Contractor's operations, and restoration of all disturbed surfaces. Included in this item is the disposition of excavated material, testing and chlorinating the pipe in place, except C.W.W. contracts, installation of gray or ductile iron water services and fire hydrant leads, as shown on the Plans, or as directed by the C.W.W. Director. Also included in this item is all costs associated with the maintenance of traffic in accordance with applicable permits and specifications.

When welded joints are required, the contractor will retain the services of a testing agency, designated/approved by C.W.W., to perform testing of all welds. Costs for this service shall be included in the price bid per linear foot (meter) of laying pipe.

1101.02 Responsibility for Material.

1101.021 Material Furnished by Contractor. The Contractor shall be responsible for all material furnished by him, and such material must conform to the requirements of the C.W.W. specifications. The Contractor shall furnish certification, analysis, and characteristics of all ductile material. Ductile material which has not been previously inspected and approved by C.W.W. will be inspected and approved at the job site. The C.W.W. Inspection Office requires 24 hours notice for this inspection and charges, when they apply, will be billed to the Contractor in accordance with Section 401.13 of the C.W.W. Rules and Regulations. Upon request by the C.W.W., the Contractor shall furnish certification, analysis, and characteristics of all other material. All materials that may come into contact with potable water must be accompanied by certification prior to approval and installation.

1101.022 Material Furnished By C.W.W. The Contractor's responsibility for material furnished by the C.W.W., shall begin when he receives issued material from the C.W.W. Water Distribution Storage Yard.

The Contractor shall inspect all material furnished him and shall reject all defective material. Arrangement for shipment of "piggy-back" trailers is the responsibility of the Contractor.

The scheduling of delivery of concrete pipe and fittings is the responsibility of the Contractor, and he shall order such delivery to allow minimum shipments of two trailer loads. The Contractor shall distribute the necessary blocks for unloading the pipe and fittings by the pipe manufacturer. After delivery, concrete pipe and fittings will become the responsibility of the Contractor. The Contractor shall inspect all material furnished him and shall reject all defective material. Arrangement for shipment of "piggy-back" trailers' is the responsibility of the Contractor.

Responsibility for all material shall remain with the contractor until final acceptance of the work by the City, and all surplus material furnished by the C.W.W. is returned to the C.W.W. Distribution Storage Yard and judged to be in proper condition.

1101.03 Unloading and Storage of Material. The Contractor shall provide all labor, material, and equipment to unload all pipes, valves, fittings, casting, or other appurtenances not unloaded by the pipe manufacturer. Suitable slings, hooks, clamps, or skids as approved by the C.W.W. Inspector, must be used on all material. Under no circumstances will any pipe, fittings, valves, castings, or other appurtenances be unloaded by dropping from the trailer or truck bed.

Pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair or replacement of such material shall be made by the Contractor at his own expense in a manner satisfactory to the C.W.W. Inspector.

All pipe and fittings on the job site shall be placed on blocks and suitably chocked to eliminate any possibility of rolling or shifting. Blocks and chocks shall have a minimum thickness of 2 inches [5.10cm] and shall be high enough to assure that the pipe and fittings will not be touched by surface drainage.

1101.04 Excavation and Preparation of Trench.

Description. The general proposed location of the pipelines and connections to the existing pipelines are shown on the Plans. If, during the course of work, unforeseen conditions arise, the location of the pipeline may be changed as directed by the C.W.W. Director to meet such conditions.

The Contractor will proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined.

Excavation. Excavation shall cover the loosening, handling, rehandling, removal, filling, and disposal of any and all materials, wet or dry, including gumbo, quicksand, hardpan, shale, rock, roadway pavement, street car rails, abandoned structures, and all unforeseen obstacles.

Excavation of rock or boulders encountered at the bottom of the trench shall be removed to provide at least the minimum 4 in. [10.20 cm] embedment below the bottom of the pipe. All voids left by the removal of rock and boulders shall be filled with backfill gravel or embedment material compacted in 4 in. [10.20 cm] lifts.

All excavation shall be made in open cuts or trenches except where tunnelling is required on the Plans or directed by the C.W.W. Director.

Test holes must be dug, or trench excavated a minimum of 100 feet [30.50 m] in advance of pipe laying, to assure proper clearance between the water pipe and any utility crossing, or underground structure. All utilities and structures shall be suitably braced and supported. The contractor shall understand any obstructions encountered in installation of the main, due to the failure of having 100 feet [30.50 m] of trench excavated ahead of laying operations, may require removal and relaying of the pipe at the at the contractors expense.

All labor and material necessary to alter the water main utilities, or structures, due to failure of the Contractor to comply with these regulations is the responsibility of the Contractor.

Disturbed Pavement and Trench. The following dimensions of disturbed pavement will normally be allowed:

Reference bid documents for more specific details.

(1) Street pavement or sidewalk should not be disturbed for a distance of more than 400 feet [122.0 m] ahead of the last laid pipe.

(2) Backfill shall be completed within 100 feet [30.5 m] of the last laid pipe.

(3) Temporary or permanent surface restoration must be installed within a distance of 400 feet [122.0 m] of the laid pipe, including those areas where main installations occur within a closed lane or closed street condition.

Widths and Depths. Excavation shall be of sufficient width and depth to permit and facilitate construction of the work to the lines, grades, and dimensions shown on the Plans or as directed by the C.W.W. Inspector. In those cases where profile grades are not indicated on the Plans, the nominal widths and depths of trenches will be as follows:

Pipe size	Cover Over Pipe	Clearance Under Pipe	Clearance Either Side Pipe
12" [.305m] and Under	3-1/2 ft. [1.067m]	4" min. [10.20cm]	6" min. [15.30cm]
16" [.406m] and over	4 ft. [1.219m]	4" min. [10.20cm]	6" min. [15.30cm]

Excavation for chambers shall be of a size that will facilitate the construction of the chambers to the dimensions specified on the C.W.W. Standard Drawings or as shown on the Plans.

Bell Holes.

Mechanical Joint and Compression Joint. Bell holes shall conform to the following dimensions;

Length - 3 feet [.915m] (2 feet [.610m] in front of joint to 1 foot [.305m] behind joint)

Width - 6 inches [15.30cm] each side of pipe barrel.

Depth - 6 inches [15.30cm] below pipe barrel.

Welded, Mechanical Coupling, Poured Lead Joints.
Bell holes shall conform to the following dimensions:

Length - 4 feet [1.220m] (centered at joint)

Width - 18 inches [45.72cm] each side of pipe barrel

Depth - 18 inches below pipe barrel

Blasting. Blasting for excavation will be permitted after securing the approval of the proper authorities and only when proper precautions are taken for the protection of persons and property.

Additional Excavation. If any excavation is carried below the depth indicated on profile because of field changes ordered by the C.W.W. Inspector, or because of unsuitable soil conditions, the Contractor will be compensated Under Item 1119.

Excavation in Unsuitable soil. Where the trench is found to be unsuitable or includes ashes, cinders, refuse, vegetable or other organic material, the Contractor shall excavate and remove such material to a depth of an additional 3" [7.6cm] to 6" [15.2cm] below normal trench bottom and an additional 4" [10.2cm] either side of the normal trench width.

Before the pipe is laid, the additional subgrade shall be made by backfilling with backfill gravel in 3" [7.6cm] uncompacted layers. The layers shall be thoroughly tamped as directed by C.W.W. Inspector, so as to provide a continuous bearing and support for the pipe when final backfill is made after the pipe is laid.

When the bottom of the trench at subgrade is found to consist of material that is unstable to such a degree that, in the opinion of the C.W.W. Inspector, it cannot be removed and replaced with granular backfill thoroughly tamped in place to support the pipe properly, the contractor shall construct a foundation for the pipe, consisting of timber, piling, or other

to support the pipe properly, the contractor shall construct a foundation for the pipe, consisting of timber, piling, or other materials, in accordance with plans prepared by the C.W.W. The Contractor will be compensated under Item 626, "Sheeting and Bracing Ordered Left in Place" and 1110, "Concrete". Additional Excavation and necessary backfill will be compensated under Item 1119, "Additional Excavation".

Sheeting and Bracing. The Contractor shall furnish, place and maintain such sheeting and bracing as may be required to securely support the sides and ends of the excavations, and to prevent injury to persons and property or to the structure being built. If at any time the Water Works so orders, the Contractor shall install such additional sheeting and bracing as the C.W.W. Inspector may consider necessary, but compliance with such orders or failure on the part of the C.W.W. to issue such orders shall in no case release the contractor from his liability for damages resulting from weak or insufficient sheeting, nor from his responsibility for protecting the work and adjacent property from damage. Voids appearing outside of sheeting shall be immediately and completely filled with suitable material in a satisfactory manner. Sheeting and bracing may be left in place at the option of the Contractor unless otherwise ordered by the C.W.W. Inspector. Sheeting and bracing shall not be removed until sufficient backfill has been placed to provide ample support to the sides of the excavation. When sheeting is left in place, it will be cut off at least 2 feet [.61m] below the proposed finished surface. Sheeting and bracing ordered left in place shall be paid for under Item 626.

Tunneling. Water mains shall be constructed in tunnels only when so indicated on the Plans or as directed by the C.W.W. Director.

When tunnels are constructed without the benefit of steel casing or tunnel liner plates the pipe area shall be backfilled as specified in the C.W.W. Standard Drawings, and the balance of the area above the pipe with Item 1110 "Concrete, Class T". The concrete portion of the backfill shall be rammed tightly against the undisturbed earth.

Tunnels constructed using steel casing or tunnel liner plates shall be installed to conform with Item 1107 and 1108.

Pipe Laying in Areas Where Grading Is Necessary. When a street is being improved or where new streets are being constructed, water mains will not be laid until the proposed sub-grade has been properly prepared as stated in the specifications. Under no circumstances will any rolling or compacting by grading equipment be allowed after water main is laid.

Water mains will **not** be installed in any area where final grades have not been established and where grading has not been performed to provide nominal cover over water main when the street is built.

1101.05 Laying Pipe and Fittings, General. Proper tools and facilities satisfactory to the C.W.W. Inspector shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench by means of derricks, ropes, or other suitable tools or equipment, in such a manner to prevent damage to the water main materials and protective coating and lining. Under no circumstances should water main material be dropped or dumped into the trench.

All pipe and fittings shall be brushed to remove all foreign matter and carefully examined for cracks and other defects while suspended above the trench immediately before installation. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed into the line.

All gray or ductile iron pipe and fittings shall be wrapped with polyethylene in accordance with C.W.W. Standard Drawing 105-5 and 105-5A.

When pipe laying is not in progress, the open ends of laid pipe shall be closed by a water tight plug or other means approved by the C.W.W. Inspector.

If water is in the trench, the seal shall remain in place until the trench is pumped dry.

Ends of the pipe shall be carefully wiped clean and dry before joining.

Pipe Embedment. The trench shall have a flat bottom conforming to the grade to which the pipe will be laid and the depth of the embedment material in the area of the pipe shall be in accordance with the dimensions as specified in Item 1101.04, and as shown on the applicable C.W.W. Standard Drawings.

All embedment material beneath the pipe shall be mechanically compacted and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints.

Where embedment material exceeds 4 inches [10.2cm] below the bottom of the pipe barrel, additional embedment material must be placed in 4-inch [10.2cm] layers and mechanically compacted.

After each pipe has been graded, aligned, and placed in its final position, embedment material shall be placed to a depth of 4 inches [10.2cm] above the top of the pipe and mechanically compacted. The Contractor shall use special care in placing this portion of backfill so as to avoid damaging or moving the pipe.

The trench backfill above the pipe embedment shall conform to Item 1101.071, and the applicable C.W.W. Standard Drawing. All restoration sections on C.W.W. contract plans shall be strictly adhered to.

Blocking and Wedging. Fire hydrants, valves, and fittings shall be laid on hardwood blocks and held in position by hardwood wedges. Blocks shall be bedded firmly in the bottom of the trench with uniform bearing and with the long dimension of the block perpendicular to the pipe barrel. Blocks shall be level across the trench and the proper number of blocks placed one upon the other to bring the fittings to the required grade.

Blocks and wedges shall conform to the minimum dimensions indicated below:

BLOCK DIMENSIONS

Pipe Size	Thickness	Width	Length
4" thru 10" [10.2cm thru 25.40cm]	2" [5.10cm]	6" [15.30cm]	12" [.305m]
12" thru 20" [.305m thru .508m]	2" [5.10cm]	1/2 of Pipe I.D.	I.D. of Pipe
24" and larger [.610m and larger]	2" [5.10cm]	12" min. [.305m]	I.D. of Pipe

WEDGE DIMENSIONS

Pipe size	Thickness (Taper)	Width	Length
4" thru 20" [10.20cm thru 50.80cm]	1-3/4" to 0" [4.45cm to 0]	4" [10.20cm]	6" [15.30cm]
24" and over [.610m and larger]	1-3/4" to 0" [4.45cm to 0]	4" [10.20cm]	6" [15.30cm]

Deflection at Pipe Joint. The maximum permissible joint opening for a regular pipe joint is 1/2 inch [1.27cm]. Joint deflections at special couplings shall not exceed manufacturer's recommendation. Joint deflections will never be permitted at valves.

Special Construction for Restraining Fittings. Under some construction situations, it is necessary to restrain a fitting by clamping, bolting, or tie-rods. Material for such work shall be furnished by the Contractor unless otherwise indicated on the Plans. The Contractor shall furnish all labor and equipment necessary to install this material.

Design and material specifications must be submitted for approval by the C.W.W. before installation.

The Contractor shall coat all exposed surfaces of the restraining devices with two coats of ANSI Standard 60/61 approved coating for potable water systems. NSF and V.L. have authority to approve coatings that meet the ANSI Standard requirements. All coating material must be applied in accordanced with manufactures recommendations.

Valve Installation. All valves must be installed so that the valve operating stem is as truly plumb as practical.

In the installation of valves 16" [.41m] in diameter and larger, the concrete floor of the valve chamber shall be poured and allowed to "set" before the valve is placed, precast floors are acceptable

Test Holes. The Contractor shall dig test holes along the line of the proposed water main to ascertain the location and elevation of utilities crossing the proposed water main and existing water mains and appurtenances where connections are shown. These excavations are considered necessary for water main installation, and cost for such holes should be included in the contract price bid for "Laying Pipe and Fittings".

When the Plans specifically indicate that a test hole must be dug, or in other places where the C.W.W. Inspector deems necessary, the Contractor will be compensated at the contract price bid for Item 1120.

Cutting of Pipe. The Contractor shall cut all pipe and special castings necessary to install the water main as shown on the Plans or as directed by the C.W.W. Inspector. The cost for this work should be included in the contract price bid for "Laying Pipe and Fittings".

The method of cutting pipe must be approved by the C.W.W. Director. At no time will the use of cutting torch or electrical devices be used to cut gray or ductile iron pipe.

Removing Existing Pipe. The Contractor shall cut and remove any existing water main normally in service to facilitate the connecting or joining of the new installation to existing water mains.

The existing pipe must be carefully cut and removed at the point designated for a connection. The Contractor must be careful not to damage valves, specials, or pipe that are to be left in service, and he will be held strictly responsible for any such damage.

Any abandoned water mains encountered in the excavation for the proposed water main installation shall be removed.

All pipe and fittings removed shall become the property of the Contractor, except for those that are salvaged under Item 1118.

The cost for removing water mains should be included in the contract price for "1101 - Laying Pipe and Fittings".

Air Cocks. Air cocks shall be installed where shown on the Plans, and other high spots that may occur in laying of pipe. The Contractor will install the air cocks in the ductile iron pipe. The C.W.W. will furnish the necessary ferrules. The cost for ferrule installation shall be included in the contract price bid for "Item 1101 - Laying Pipe and Fittings".

The Contractor will install air cocks in the connections provided by the pipe manufacturer in concrete and steel pipe. The cost of constructing the chamber will be covered under Item 1111 "Water Works Chambers".

Reconstruction of Subsurface Structures. If in the installation of the water main in accordance with the Plans it becomes necessary to alter or reconstruct a culvert, sewer manhole, valve chamber, catch basin connection, water main, water service or sewer tap connections, in the same or new location, the work shall be performed by the Contractor upon order from the C.W.W. Inspector. The Contractor will be paid for such work at the contract price bid for the following applicable Items: 1101, 1126, 1110, 602 and 1123.

The Contractor shall not make any changes in the position of any utility without the written consent of the owner.

Sealing Abandoned Utilities. Open ends of abandoned water mains, or water mains to be abandoned with this project, or any other utility, which are cut because of trenching operations, shall be sealed with a brick or concrete bulkhead. The Contractor shall be compensated for this work under Items 602 and/or 1110.

1101.051 Railroad Crossing. Wherever the proposed water main crosses under a railroad track, it shall be placed in a suitable casing or tunnel liner in the manner specified on the Plans. See Item 1107 and Item 1108 which cover material and construction requirements for casing and tunnel liner.

The Contractor shall give the owner of railroad property adequate notice before proceeding with any work involving the track, right-of-way, and appurtenances. The cost for any special traffic control, supporting devices, or other necessary precautions involving railroad personnel or property, shall be compensated as indicated in the Special Provisions of the Contract Plans.

1101.052 Creek Crossing. Wherever the proposed water main crosses under a creek bed, it shall be installed in accordance with Contract Plans or C.W.W. Standard Drawings. Concrete and reinforcing steel will be compensated for Under Item 1110 and 509. All pipe joints and fittings shall be restrained per C.W.W. contract documents.

1101.053 Maintaining Water Service and Temporary Lines. It is the Contractor's responsibility to maintain adequate water supply to consumers and for fire fighting purposes. The Contractor must schedule his operations to assure that water services and fire hydrants will not be out of service for more than the length of time which, in the opinion of the C.W.W. Director, is required for making necessary connections.

When water service may not be interrupted for the length of time required to make connections, the C.W.W Director may order the Contractor to furnish, install, and maintain temporary pipelines. These temporary lines shall be of the size approved by the C.W.W. Director, which will in his opinion adequately supply water for normal consumption and fire protection. All such temporary pipe lines shall be sterilized to the satisfaction of the C.W.W. Inspector.
No additional payment will be made for temporary water mains or services unless specifically stated on the Plans or as a bid item in the Contract Proposal.

1101.054 Hydrostatic Test for Leakage. After the pipe has been laid and backfilled,all newly laid pipe shall be subjected to hydrostatic pressure 50 psi [344.75KPa] greater than the nominal working pressures in the line being tested.

All mains 24" [.61m] and larger and on all C.W.W. contracts the C.W.W. will provide the equipment and labor to pressure test new mains. In the event pressure testing results in a failure by Cincinnati Water Works Standards, the Contractor will be responsible for all costs associated with the Water Works personnel conducting subsequent testing, on all other mains the Contractor is responsible to provide the equipment and labor necessary for testing.

The section of pipe being tested shall be isolated by the Contractor by the installation of temporary plugs. The pipe shall be slowly filled with water and all air shall be expelled from the pipe. The filled water main shall be allowed to remain under working pressure for a period of twenty-four hours to permit the concrete lining to absorb water and to allow the escape of entrapped air.

The leakage test shall begin after the twenty-four hour period. The water main shall be pumped to a pressure 50 psi [347.75KPa] over the working pressure. The maximum allowable leakage in cubic feet[meters], while maintaining test pressure, shall be:

Ductile-Iron Pipe

Mechanical joint and push-on joint:

$$\text{Allowable Leakage} = \frac{L\ D\sqrt{P}}{498168} \text{ in cubic feet per 2 hours [x.02832=in cubic meters per 2 hours]}$$

Concrete Pipe

$$\text{Allowable Leakage} = \frac{D\ L}{18957} \text{ in cubic feet per 2 hours [x.02832=in cubic meters per 2 hours]}$$

Where: D = nominal inside diameter of pipe in inches
P = test pressure in pounds per square inch
L = length of pipeline in feet

Test pressure with leakage not exceeding the maximum allowable shall be maintained for a two-hour test period. In the event that leakage within the maximum allowable cannot be maintained, the Contractor shall locate and eliminate sources of water loss. All material, labor, and equipment necessary for this work shall be furnished by the Contractor and at his expense.

After the Contractor has located and eliminated the sources of water loss, the leakage test shall be repeated.

The Contractor installing the main will be responsible for making the test unless indicated otherwise on Water Works drawings.

The Contractor will provide all labor and equipment, including pumps necessary to apply the test.
The Water Works will provide the necessary gauges and meters.

1101.055 Disinfection of Water Mains. All new water mains and all modifications to existing water mains shall be properly disinfected prior to being placed into service.

The Contractor is advised that the inside of all lengths of water mains and fittings shall be thoroughly cleaned with a chlorine/water solution prior to installation. The Contractor's method for cleaning must meet the prior approval of the Cincinnati Water Works.

The section of water main being disinfected shall be isolated by means of temporary plugs installed by the Contractor before beginning the disinfecting procedure.

Each dead end point of a new ductile iron water main will require a temporary 1" [2.50cm] tap which will be used to obtain bacteria samples. For concrete water mains, a 2" [5.10cm] tap provided on the bulk head shall be utilized. Responsibility for maintaining access to the sampling tap will be with the Contractor. The necessary ferrules will be supplied by the Water Works.

In case where the newly installed water main terminates at a fire hydrant, the Contractor shall install a 1" [2.50cm] tap ahead of the fire hydrant control valve.

Ductile iron water main shall be charged with chemicals supplied by the C.W.W., filled with water, and allowed to stand for a period of twenty-four hours. When a non-liquid chlorine is used and cold weather dates established by C.W.W., are in effect, the filled main will stand a minimum of 48 hours. All mains 24" [.610m]and larger are charged with liquid chemicals and filled with water by the C.W.W., and allowed to stand for a minimum of 24 hours at all times of the year.

The amount of residual chlorine will be analyzed. If the main being disinfected fails to maintain the minimum allowable residual chlorine content, the disinfection procedure will be repeated.

In the event that the bacteria testing results in a failure by Cincinnati Water Works Standards, the Contractors will be responsible for all costs associated with the Water Works personnel conducting subsequent testing.

In the event the residual chlorine is not sufficient after the second disinfection procedure is completed, the Contractor shall remove sections of main, fire hydrants, or other appurtenances for proper flushing. All material, labor, and equipment necessary for this work shall be furnished by the Contractor and at his expense.

After the main has passed the pressure test and is flushed down to system chlorine levels a bacteria sample will be taken by the valve room personnel at each dead end section of water main. A second and final sample will be taken 24-hours after the first sample. Each sample will require a minimum of 24-hours before results can be obtained, therefore the results of the bacteria samples will not be known for a minimum of 48-hours after the first sample is taken. If all samples show no signs of bacteria the water main will be allowed to be tied-in. The Water Works will notify the Contractor when the water main is able to be tied-in.

All labor and material necessary to comply with this regulation shall be included in the contractor's unit bid price for Item 1101 - Laying Pipe and Fittings. No extra payment will be made for this work.

1101.06 Joining Pipe.

General. The Contractor shall join all pipe and fittings in the manner specified by the C.W.W. The Contractor will be expected to complete any and all types of joints that are necessary. Joints at connections are specified from available information.

1101.061 Joining of Bell and Spigot Pipe. The yarning material shall be the best quality packing braided jute, unoiled and untarred. The yarning material shall be placed around the spigot of the pipe and shall be of proper dimensions to center the spigot in the bell. When the spigot is shoved home, the yarning material shall be driven tightly against the inside hub of the bell with a suitable yarning tool.

When a single strand of yarning material is used, it shall have an overlap at the top of not more than 2 inches [5.10cm]. When more than a single strand is required for a joint, each strand shall be cut to sufficient length so that the ends will meet without causing overlap. The ends of the strands shall meet on opposite sides of the pipe, and not on top or at the bottom. Successive strands of yarning material shall be driven home separately.

A lead joint runner (snake) shall fit snugly against the face of the bell and the outside of the pipe and shall be damned with clay between the pipe and the runner where required. A clay pouring gate shall be built as high as the top of the hub of the pipe and not less than 3 inches [7.60cm] along the circumference of pipe and 1 inch [2.50cm] wide.

Lead. No substitute for lead will be allowed in making any poured joint. The lead for pipe joints shall be of a special compound available from the C.W.W. The Contractor may obtain this compound by furnishing the C.W.W. with an equal amount of pig lead having the following characteristics:

(1) Soft and malleable.

(2) Cylinder 2 incnes [5.10cm] in diameter and 3 inches [7.60cm] high, cast from the pig, shall compress not less than 50 per cent under a pressure 15,000 psi [103.4MPa], and no crack shall develop on the circumference of such cylinder under a pressure of 60,000 psi [423.7KPa].

The lead shall be heated in a melting pot, kept within easy reach of the joint to be poured, and shall be brought to the proper temperature. Before pouring, all scum shall be removed. Each joint shall be made with one continuous pour filling the entire joint space with solid lead. Spongy, stringy, or imperfectly filled joints shall be burned out and repoured.

Caulking. After the lead has cooled to the temperature of the pipe, lead joints shall be caulked with pneumatic or hand tools operated by competent workmen. The caulking shall be done utilizing a proper set of caulking tools which include a caulking chisel and a series of at least five (5) caulking irons ranging from 3/16" [.48cm] through 3/4" [1.91cm] in size.

The caulking chisel shall be employed first against the barrel of the pipe, followed by the smallest size caulking iron up through the largest size caulking iron that the joint can accommodate.

After caulking has been completed, the joint must be left neat and even. Joints of all pipe shall be at least 5/16" [.79cm]. thick, and after caulking, the depth shall be (see chart, following page):

Diameter of Pipe (inches)	**Joint Depth After Caulking (inches)**
4" to 6" [10.20cm to 15.30cm]	2-3/4" [6.99cm]
8" to 24" [20.30cm to .610m]	3" [7.60cm]
30" to 36" [.762m to .915m]	3-1/2" [8.89cm]
42" to 48" [1.067m to 1.220m]	4" [10.20cm]
over 48" [1.220m]	4-1/2" [11.43cm]

1101.062 Joining of Mechanical Joint Pipe.

1101.062 Joining of Mechanical Joint Pipe.

Cleaning and Assembly. The last 8 inches [20.30cm] outside of spigot end, inside of bell, and the ductile iron gland shall be thoroughly wire brushed to remove all oil, grit, excess coating, and other foreign matter from the joint, and then painted with a non-toxic soap solution. The ductile iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

Bolting of Joint. The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed into place within the bell; care shall be taken to locate the gasket evenly around the entire joint. The ductile iron gland shall be moved along the pipe into position for bolting, all of the bolts inserted and the nut screwed up tightly with the fingers. When a torque-limiting wrench is used, the torque for various sizes of bolt shall be as follows:

Bolting Diameter (inches)	**Range of Torque (ft. - lb.)**
5/8" [1.59cm]	40-60 [54.2 - 81.4nm]
3/4" [1.91cm]	60-90 [81.4 - 122nm]
1" [2.50cm]	70-100 [94.90 - 135.60nm]
1-1/4" [3.18cm]	90-120 [122.00 - 162.70nm]

If a wrench other than a torque-limiting type is used, the following wrenches shall be used:

Bolt Diameter (inches)	**Length of Wrench (inches)**
5/8" [1.59cm]	8" [20.30cm]
3/4" [1.91cm]	10" [25.40cm]
1" [2.50cm]	12" [.305m]
1-1/4" [3.18cm]	14" [.356m]

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. Any leaks that shall appear on any joint will require disassembly, cleaning, and reassembly.

1101.063. Joining of Push-on Joint Pipe (Compression Joint); Ductile Iron.

Cleaning and Assembly. The inside of the bell and the outside of the spigot shall be thoroughly cleaned to remove all oil, grit, excess coatings, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the bell socket.

A thin film of non-toxic vegetable base gasket lubricant, meeting ANSI Standard 60/61 requirements, shall be applied to the surface of the gasket and the spigot end of the pipe. No mineral oil or petroleum based lubricant may be used. Gaskets and lubricant shall be in workable condition during cold temperatures or pipe-laying will not be permitted.

The spigot end of the pipe shall be entered into the socket with care used to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end of the pipe to the seat of the socket with a forked tool, jack-type tool, or other approved method. Twelve inch [.305m] diameter and smaller pipe may be inserted with the used

Pipe must be marked with a depth mark before assembly to assure that the spigot end is inserted to the full depth of the joint.

Field-cut pipe lengths shall be filed or ground to obtain a chamfer, on outside of pipe, 1/8 inch [.32cm] from cut edge and at an angle of 30 degrees with the cut edge. All rough or sharp edges shall be removed from the cut edge to prevent possible damage to the rubber gasket.

1101.064 Joining Steel Pipe.

Manufacture / Installation. Steel pipe shall be manufacterd and installed in strict accordance with the most current editions of AWWA Specification C200 and AWWA M11 (Steel Pipe Installation Manual)

1101.065 Joining Concrete Pipe.

Cleaning and Preparing the Joint. The spigot ring and bell ring of each pipe joint pipe shall be wire-brushed and along with the rubber gasket thoroughly cleaned to remove all oil, grit, excess mortar, and other foreign material. An approved vegetable base lubricant shall be used to lubricate each gasket, spigot ring, and bell ring immediately before making the joint. The gasket groove of the spigot ring shall be well lubricated. No foreign matter of any kind shall be allowed to touch any area after it has been lubricated.

Methods of Making Joints. The Contractor may, with the approval of C.W.W. Inspector, select one of the methods listed below for the installation of pipe.

Pull-jack inside method. The anchoring post for the jack shall be placed at least three lengths from the pipe being installed. The anchor posts must be firmly wedged in a manner to resist the pull necessary to install the pipe, but shall in no way mar or chip the lining of the pipe.

Pull-jack outside method. The anchoring sling for the jack shall be placed at least three lengths from pipe being installed, or an extra heavy trench jack securely braced against the trench may be used in place of the sling.

Back-hoe method. The pipe may be pushed "home" by the use of a back-hoe. The Contractor shall understand that if this method is used, oak blocking between the pipe spigot or bell,and backhoe bucket must be utilized. Any obstructions encountered in the installation of the pipe, due to the failure of having 100 feet [30.50m] of ditch open ahead of laying operations, may require the removal and relaying of the pipe at the Contractor's expense.

Checking the Joint. A 5/8 inch [1.59cm] thick metal joint stopper shall be placed at the spring line, between the spigot ring and "home" of the pipe bell, at the time the pipe is inserted. A feeler gauge shall be used to check the rubber gasket alignment in the gasket groove. When the rubber gasket is properly aligned, remove the stopper, and insert the pipe to the full joint depth.

Completing the Joint. A mortar mix composed of one part masonry cement 701.07, two parts of fine aggregate 703.03, and Cincinnati hydrant water or equal, mixed to a grout consistency shall be used to complete the joint outside, and a stiff consistency for the joint inside.

A "diaper" furnished by the pipe fabricator shall be firmly secured around the outside of the joint, and the grout mixture poured down inside the "diaper" from alternate sides of the opening, until the "diaper" is full. The top of the joint shall be troweled with stiff mortar.

A "diaper" furnished by the pipe fabricator shall be firmly secured around the outside of the joint, and the grout mixture poured down inside the "diaper" from alternate sides of the opening, until the "diaper" is full. The top of the joint shall be troweled with stiff mortar.

The inside of the joint shall be furnished with the stiff mortar to achieve a smooth effect and any excess mortar shall be removed.

Coating Mechanical Couplings and Closure Assemblies. All exposed steel pipe, couplings, flanges, or bolts, either buried or in chambers, shall be coated with at least two coats of "Koppers Bitumastic 50", Koppers Bitumastic 300M:, or approved equal. All coating material must be applied in accordance with manufacturer's recommendations.

For closure assemblies, a casing of concrete (one part Portland cement and two parts sand) will be used. The concrete shall be poured to obtain a minimum thickness of (3) inches [7.60cm] around the outside of the exposed assemblies. Prior to pouring of concrete, the closure assemblies are to be completely wrapped in polyethylene.

1101.07 Backfilling. The Contractor shall backfill all pipe trenches, tunnel shafts, test holes, and other excavations required to install the proposed water main work as shown on the Plans or as directed by the C.W.W. Inspector.

Backfilling shall conform to the C.W.W. Standard Drawings.

1101.071 Material.

Backfill Gravel shall conform to 703.11.

Pea Gravel may be unwashed and 100 per cent of the material shall pass 1/2-inch [1.27cm] sieve, a minimum of 25 per cent a No.10 sieve, and a maximum of 10 per cent a No.100 sieve. It shall not contain any slag, cinders, ashes, refuse, or other objectionable material.

Coarse Fill shall be that material excavated from the trench but must be reasonably free from rubbish, muck, shale, topsoil, or other unsuitable material. Maximum dimension of rock shall not exceed 3 inches [7.60cm].

Granular Material shall be in accordance with 310 Grading A except that no slag, slaker aggregate, or broken salvaged road metal will be allowed.

Methods for Backfilling.

Low Strength Mortar (LSM-50) is an acceptable backfill material. The LSM is to be of a 50psi mix design. Prior to placement of LSM a compacted 12" [.305m] bedding of granular material above all utilities with the excavation is required.

Method A Backfill shall conform to the C.W.W. Standard Drawings. After the embedment material has been placed, the balance of the backfill material shall be placed in six-inch [15.20cm] compacted layers by a satisfactory mechanical means. Unless specifically noted on the Plans, all backfill shall conform to Method A.

Method B Backfill shall conform to the C.W.W. Standard Drawings. After the embedment material has been placed, the balance of the backfill material shall be placed in six-inch [15.20] compacted layers by a satisfactory mechanical means. Method B will only be permitted when shown on Plans or specified in the Contract Proposal.

jetted with water to saturation. Following jetting, all free water will be removed from the trench by pumping or any other effective means. All jetting must be performed in lifts in strict compliance with the State of Ohio Department of Transportation Construction and Material Specifications.

Special Backfill. When other than standard backfilling is required, it will be so indicated on the Plans or noted in the Proposal.

1101.072 Restoration. The Contractor shall perform all temporary and permanent restoration as indicated on the contract plans and/or in compliance with the requirements of the City of Cincinnati, Hamilton County, or appropriate political jurisdiction.

All surface asphalt, temporary and /or permanent, must be rolled into place. Mechanical tamping or any other means shall not be permitted.

Seeding performed within all drainage areas shall be done in accordance with Item 667, 668, and appropriate ODOT specifications. A reinforced woven fabric shall be used.

Water main insatllation, within the City of Cincinnati requires that the contractor is responsible to replace all traffic control lines and devices disturbed by construction. Traffic lines and devices shall meet City of Cincinnati specification for Traffic Control. All traffic lines and devices within other political jurisdictions shall be replaced as directed by a represenative of the appropriate jurisdiction.

1101.08 Method of Measurement. The length of water main installation to be paid for will be the actual number of linear feet [meters] of pipe, specials, an fittings measured along the center line of the water main in place, completed and accepted.

1101.09 Basis of Payment. The payment for work done under this item shall be at the unit price bid, which payment shall be full compensation for all labor, material, equipment, and related testing, required to lay the pipe and fittings, and perform restoration as herein specified.

Water main installation, within the City of Cincinnati, requires that the contractor is responsible to replace all traffic control lines and devices disturbed by construction. Traffic lines and devices shall beet City of Cincinnati specifications for Traffic Control. All traffic lines and devices within other political jurisdictions shall be replaced as directed by a representative of the appropriate jurisdiction.

Payment will be made at the contract price for:

Item	Unit	Description
1101	Linear Foot [meters]	Laying___" [cm] (type of pipe) and Fittings
1101	Linear Foot [meters]	Furnishing and Laying ___" [cm] (type of pipe) and Fittings

ITEM 1102 - HAULING WATER WORKS MATERIAL

1102.01 Description

1102.02 Method of Measurement

1102.03 Basis of Payment

1102.01 Description. The Contractor shall load and haul all material furnished by the Cincinnati Water Works, from a C.W.W. Distribution Storage Yard, , or other designated location, to the project site. The material shall be unloaded and stored, by the Contractor, in the manner described in Item 1101.03.

1102.02 Method of Measurement. Payment for this item will be based on the total tonnage hauled of all material furnished at the points specified above Item 1102.01 to the job site, and the returning of all surplus material furnished by the C.W.W. to a C.W.W. Distribution Storage Yard. See Item 1101.02.

Concrete pipe and fittings will be delivered to the job site by the pipe manufacturer. Excess concrete pipe and fittings shall be returned to the C.W.W. Distribution Storage yard by the Contractor.

The hauling of material furnished by the Cincinnati Water Works for service branches, will not be paid for under this item. See item 1126.

Any additional movement of any pipe or material within the confines of the project, is the responsibility of the Contractor and the cost of any such work shall be included in the price bid per linear foot [meter] of laying pipe, Item 1101.

1102.03 Basic of Payment. The unit price bid per tons [tonne] for hauling Water Works material will be full compensation for all labor, material and equipment required to load, haul, and unload material furnished by the C.W.W. as described above.

Payment will be made at the contract price for:

Item	Unit	Description
1102	Tons [tonnes]	Hauling Water Works Material

ITEM 1103 - LOWERING EXISTING WATER MAINS

1103.01 Description

1103.02 Material

1103.03 Construction

1103.04 Measurement

1103.05 Basis of Payment

1103.01 Description. This item shall cover the lowering of existing water main, fittings, and fire hydrants where shown on the Plans or as directed by the C.W.W. Inspector. Unless otherwise indicated on the Plans, the Contractor must perform this operation while the water main is under pressure,and must maintain water supply for domestic consumption and fire fighting purposes. The Contractor shall restore the disturbed area as required.

1103.02 Material. Replacement polyethylene tubes and tape, bolts and nuts for mechanical pipe joints and couplings, and additional pipe and fittings necessary for lowering pipe will be furnished by the C.W.W. The contractor shall furnish all other material required to lower existing water main,and to make joints water tight.

1103.03 Construction.

1103.031 General. The contractor shall dig test holes at those locations indicated by the C.W.W. Inspector to determine the elevation of the existing water main. If the elevation of the existing water main warrants lowering,the contractor shall excavate the trench under the water main and lower the water main so that the top of the pipe will be 3-1/2 feet [1.067m] below the surface of proposed finished grade.

Where water main is encased in polyethylene remove the existing encasement. Replacement polyethylene encasement shall be installed in accordance with Standard Drawing 105-5 where applicable.

If the elevation of the existing water main indicates lowering is not necessary, the Contractor will be compensated for the test holes under Item 1120.

In the event other underground structures interfere with the lowering process, the water main shall be cut or disconnected, and relaid below such structures.

Lowering shall be done gradually and in a careful manner. The Contractor will be held responsible for any cracking, breakage, or damage to the pipe and appurtenances.

After the pipe has been lowered, the C.W.W. Inspector will check all joints, and if he judges them to be water tight, the Contractor shall properly backfill and restore the trench area. All temporary and permanent restoration shall be in compliance with the requirements of the City of Cincinnati; Hamilton County,or appropriate political subdivision.

1103.032 Lead Joints. All poured lead joints shall be recaulked or repoured if necessary to make the joint water tight.

1103.033 Mechanical Joints. All mechanical joint bolts and nuts shall be removed and replaced with bolts and nuts furnished by the C.W.W. When necessary to provide water tightness, the pipe shall be cut and a new rubber gasket installed.

1103.034 Sulphur Based Jointing Compound. Joint leak occurring in sulphur based jointing compound joints will require the removal of the joint and replacement with new pipe and mechanical sleeves.

1103.035 Mechanical Coupling. All bolt and nuts will be removed and replaced with new bolts and nuts furnished by the C.W.W.

1103.04 Measurement. The length of water main lower to be paid for will be the actual number of linear feet [meters] of pipe and fittings measured along the center line of the lowered water main in place, completed, and accepted. The price per lineal foot [meter] of water main lowered will include the resetting of fire hydrants.

1103.05 Basis of Payment. The payment for work done under this item shall be at the unit price bid, which payment shall be full compensation for all labor, material, and equipment to lower the water main, fittings, fire hydrants , and perform restoration, as herein specified.

Payment will be made at the contract price for:

Item	Unit	Description
1103	Linear Foot [meter]	Lowering Existing ___" [cm] Water Main

ITEM 1104 - INSTALLING VALVES ON EXISTING WATER MAINS

1104.01 Description

1104.02 Material

1104.03 Construction

1104.04 Basis of Payment

1104.01 Description. This item shall cover the installing of valves on existing water mains.

1104.02 Material. All valves, pipe and fittings must be inspected and approved by the C.W.W. Valves, when furnished by the Contractor, must be purchased from the C.W.W.

1104.03 Construction. The Contractor shall make any necessary excavation, cut and remove a piece of existing pipe, and install a valve, necessary pipe, and fittings conforming to Item 1101. All excavations shall be properly backfilled 1101.07 and all disturbed surfaces restored.

1104.04 Basis of Payment. The payment for this work shall be made at the unit price bid, which shall be full compensation for furnishing all labor, material and equipment required to make the excavation, cut and remove existing pipe, install new valve, pipe, and fittings, install polyethylene, properly backfill and restore all surfaces.

Payment will be made at the contract price for:

Item	Unit	Description
1104	Each	Installing ___" [cm] Valve on Existing Water Main
1104	Each	Furnishing and Installing ___" [cm] Valve on Existing Water Main

ITEM 1105 - PLUGGING EXISTING WATER MAINS AND FITTINGS

1105.01 Description

1105.02 Construction

1105.03 Basis of Payment

1105.01 Description. The Contractor shall plug existing water mains and specials at the point indicated on the Plans, or as otherwise required, and place concrete blocking, backfill, and restore all disturbed surfaces.

Plugging work not covered by this item.

- Any plugs required for testing or sterilization purposes.
- Any plugs made for the convenience of the Contractor.
- Any permanent plugs placed in water mains or specials in the installation of new water mains.
- Any temporary plugging necessary to provide water for consumers or fire protection, unless specifically indicated on the Plans as a pay item.

1105.02 Construction. The Contractor shall make the necessary excavation and carefully remove the old pipe, install the plug, and make the required joint.

The plug shall be firmly secured with a mechanical clamp and/or blocked with concrete Class "C" as directed by the C.W.W. Inspector.

The excavation shall be backfilled as described on the C.W.W. Standard Drawing and disturbed surfaces restored. Open ends of water mains abandoned because of the installation of plugs, shall be sealed with a brick or concrete bulkhead. The Contractor shall be compensated for this work under Item 602 and/or 1110.

1105.03 Basis of Payment. The unit price bid for plugging the various sizes of water mains and specials shall be full compensation for all labor, material, and equipment necessary to complete the work as required in above specifications.

Concrete used for blocking will be paid for under Item 1110.

Payment will be made at contract price for:

Item	Unit	Description
1105	Each	Plugging Existing ___" [cm] Water Mains and Fittings

1105	Each	Furnishing and Installing ___" [cm] Plugs in Existing Water Mains and Fittings

ITEM 1106 - FURNISHING AND INSTALLING FOAMGLAS PIPE INSULATION

1106.01 Description

1106.02 Method of Measurement

1106.03 Basis of Payment

1106.01 Description. This item shall cover the furnishing of all labor and material necessary to install FoamGlas preformed pipe insulation wrapped with a double layer of polyvinyl tape on water mains.

Water Main Size	**Insulation Thickness**
4" - 8" [10.20cm - 20.30cm]	2-1/2" [6.35cm]
10" - 16" [25.4cm - 40.64cm]	3-1/2" [8.90cm]

1106.02 Method of Measurement. The length of pipe insulation to be paid for will be the actual number of lineal feet [meters] of pipe insulation measured along the centerline of the pipe insulation in place, completed and accepted.

1106.03 Basis of Payment. Payment for this item will be made at the unit price bid which will be full compensation for all labor, material, and equipment required for the installation of the 2-1/2" [6.35cm] or 3-1/2" [8.90cm] thick pipe insulation.

Payment will be made the contract price for:

Item	**Unit**	**Description**
1106	Lineal Foot [meter]	Furnishing and Installing ___" [cm] FoamGlas Pipe Insulation

ITEM 1107 - FURNISHING AND INSTALLING TUNNEL LINER

1107.01 Description

1107.02 Material

1107.03 Construction

1107.04 Measurement

1107.05 Basis of Payment

1107.01 Description. This work shall consist of furnishing and installing a tunnel liner of the size indicated, to permit the laying of water mains as shown on the Plans or as directed by the C.W.W. Inspector.

1107.02 Material.

Tunnel Liner	-	City of Cincinnati Department of Purchasing Spec. 5-3 or latest revision thereof.
Cement for grout	-	701.04
Sand for grout	-	703.03
Concrete, Class "C"	-	1110.021
Pea Gravel	-	1101.071
Brick	-	704.02

1107.03 Construction. The Contractor shall make any necessary excavation, mining and boring necessary to install the tunnel liner. A shaft of adequate size to facilitate the work shall be provided at the beginning of the tunnel installation, and must be sheeted and timbered as required to fully protect the structure and the workmen, and prevent settlement of pavement curbs, walks, buildings, or other structures.

The tunnel shall be lighted and ventilated to allow proper construction and inspection. The engineer will provide control points inside the tunnel as work progresses, to allow the Contractor to install the liner to the line and grade as shown on the Plans or as directed by the C.W.W. Inspector. It is the Contractor's responsibility to protect and safeguard such control points from damage or movement, and to utilize these control points in the installation of the tunnel liner.

The liner plate diameter shown on the Plans has been determined to permit a maximum deviation of 6 inches [15.2cm] from true line and grade. Any deviation greater than 6 inches [15.2cm] shall be corrected by re-mining, so that the pipe may be laid to true line and grade in the tunnel.

One panel containing a grout hole shall be installed in each ring or course, and they shall be spaced 90 deg. apart, circumferentially, in each succeeding ring or course. The Contractor shall do all grouting necessary to back up the liner plates and fill all voids. The grouting shall be carried out as directed by the C.W.W. Inspector.

The Contractor shall install a concrete base or floor as wide as the O.D. of the pipe, the full length of the tunnel, to provide a firm footing for the oak blocking supporting the water main.

After the water main is laid in the tunnel, the Contractor shall completely backfill the area between the outside of the water main and the tunnel liner plates with pea gravel.

Both ends of the completed tunnel shall be closed with 4-inch [10.2cm] brick bulkheads, and when so instructed by the C.W.W. Inspector, a 4-inch [10.2cm] drain shall be installed in the bulkhead.

1107.04 Measurement. The length of tunnel liner to be paid for will be the actual number of linear feet [meters] as measured along the center line of the water main.

Payment for this item will constitute full payment for all excavation, installation of tunnel liner, concrete floor, grouting, bulkheads, and drains, backfilling of tunnel and shafts, restoration, labor, material, and equipment necessary to install the tunnel liner as specified above.

The Contractor will be compensated for the installation of the water main in the tunnel liner under Item 1101 "Laying Pipe and Fittings".

When the C.W.W. Inspector orders sheeting and bracing to remain in tunnel shafts or pipe trenches, the Contractor will be compensated under Item 626 "Sheeting and Bracing Ordered Left in Place".

1107.05 Basis of Payment. The number of linear feet [meters] of tunnel liner of the specified size will be paid for at the unit price bid in the contract.

Payment will be made under:

Item	Unit	Description
1107	Linear Foot [meter]	Furnishing and Installing ___" [cm] Tunnel Liner

ITEM 1108 - FURNISHING AND INSTALLING STEEL CASING

1108.01 Description

1108.02 Material

1108.03 Construction

1108.04 Measurement

1108.05 Basis of Payment

1108.01 Description. This work shall consist of furnishing and installing a casing of the diameter and wall thickness indicated and furnishing and installing approved casing insulators, to permit the laying of a water main as shown on the Plans or as directed by the C.W.W. Inspector.

1108.02 Material.

Steel	A.S.T.M., A-139 Grade B
Type of Jointing	Welded
Brick	704.02
Concrete, Class "C"	1110.021

1108.03 Construction. The Contractor shall make any necessary excavation to complete the boring or jacking operation to install the steel casing. The method of boring or jacking operation must be submitted to the C.W.W. for approval. The engineer will provide control points for the casing installation, and the Contractor shall install casing to conform to these control points. Any deviation in grade or alignment of the casing, which shall prevent the installation as designed or access for maintenance, will require the Contractor to re-install the casing in the proper manner.

The Contractor shall furnish and install approved water main casing insulators as specified in the C.W.W. Standard Drawings.

After the water main is laid, the Contractor will completely fill all voids between the outside of the pipe and the casing with pea gravel. Both ends of the casing shall be closed with a 4-inch [10.2cm] brick or concrete bulkhead. When instructed by the C.W.W. Inspector a 4 inch [10.2cm] drain shall be installed in the bulkhead.

1108.04 Measurement. The length of steel casing to be paid for will be the actual number of linear feet [meters] as measured along the water main. Payment under this item will constitute full payment for all excavation, installation of casing, bulkheads, backfilling of casing and shafts, restoration, labor, material, and equipment necessary to install thecasing as specified above.

The Contractor will be compensated for the installation of the water main in the steel casing under Item 1101, "Laying Pipe and Fittings".

When the C.W.W. Inspector orders sheeting and bracing to remain in casing shafts or pipe trenches, the Contractor will be compensated under Item 626, "Sheeting and Bracing Ordered Left in Place."

1108.05 Basis of Payment. The number of linear feet [meters] of casing of the specified size will be paid for at the unit price bid in the contract.

Payment will be made under:

Item	Unit	Description
1108	Linear Foot [meter]	Furnishing and Installing ___" Steel Casing

ITEM 1109 - EXCAVATING FOR TAPPING SLEEVE AND VALVE

1109.01 Description

1109.02 Construction

1109.03 Basis of Payment

1109.01 Description. The Contractor shall excavate a pit in accordance with the dimensions shown on Water Works Standard Drawings.

1109.02 Construction. The Contractor shall make the excavation in accordance with the Water Works Standard Drawings and conform to the pertinent references in 1101.04.

The Water Works' forces will install the tapping sleeve and valve and tape the water main.

Construction of the chamber, if one is required, will be compensated for under Item 1111. If a valve box is installed, it will be paid for under Item 1116.

The Contractor shall properly backfill, compact the excavation, and make the necessary restoration.

1109.03 Basis of Payment. Payment for this item will be made at the unit price bid in the contract.

Item	Unit	Description
1109	Each	Excavating for ___" [cm] x ___" [cm] Tapping Sleeve and Valve

ITEM 1110 - CONCRETE

1110.01 Description

1110.02 Materials

1110.03 Construction

1110.031 Structures

1110.032 Backfill Concrete

1110.033 Use of High-Early Concrete

1110.04 Method of Measurement

1110.05 Basis of Payment

1110.01 Description. This item shall consist of furnishing and placing the various classes of concrete listed in 1110.02, in the necessary formwork, in accordance with these specifications, as shown on the Plans or as directed by the C.W.W. Inspector.

1110.02 Materials. Materials shall be as follows:

1110.021 Concrete Class "C" - 499

1110.022 High-Early Concrete Class "C" - 499 except Portland Cement shall conform to 701.02 and 701.05.